Method for transferring a software module from a sender to a receiver in a computer system or network

The invention relates to a method for transferring a software module from a sender to a receiver in a computer system or network, wherein the software module comprises at least one object and at least one class, the object being an instance of the class(es).

In object-oriented software technology it is known to build a software module as a combination of so-called objects and classes, wherein the or each object that belongs to a class, is called an instance of the class. The objects generally contain only particular values for the variables specific to a predetermined software module, wherein the variables and methods to be carried out by the software module are defined in the class or classes.

With increasing use of computer systems and networks, such as the Internet, there is an increasing transfer of software modules of the object-oriented type between processes executed within one computer system of between computers of a computer network. This increasing transferring of software modules results in an increase of data traffic within the computer system of computer network.

A first object of the present invention is to provide a method of the above-mentioned type, wherein the data traffic within a computer system or computer network during transferring a software module is reduced.

It is a further object of the invention to provide a method of this type, wherein a software module can be transferred in a secure manner.

According to the invention a method of the above-mentioned type is provided, wherein each class or group of classes is provided with a class identifier, wherein both the sender and receiver comprises a database of classes and groups of classes with corresponding class identifiers, wherein the

sender transmits the class identifier of a software module to be transferred to the receiver and the receiver checks its database for presence of the received class identifier, wherein the receiver transmits a message "present" or "absent" to the sender and wherein the sender transfers only the object of the software module or both the object and the class or group of classes depending on the presence or absence of the class or group of classes at the receiver.

In this manner a method is obtained, wherein data traffic during transferring software modules is significantly reduced as the classes or groups of classes need not to be transferred in all transfers of software modules.

According to a favourable embodiment of the invention, the sender provides a class identifier by combining a given name of each class or group of classes of a software module and the result of a cryptographic hash function, wherein said result is obtained by executing a cryptographic hash function on the data file of the class or group of classes. In this manner a secure identifier is obtained, wherein errors due to identical identifiers for different classes or groups of classes are excluded.

According to a preferred embodiment, the receiver checks a class or group of classes received from a sender by comparing the result of the hash function of the received class identifier with the result obtained by carrying out the same cryptographic hash function on the data file of the class or group of classes received.

In this manner security in transferring software modules is guaranteed as receivers will refuse to use classes where the hash function result of the identifier does not match with the hash function result obtained by the receiver from the data file of the class or the group of classes received.

The invention will be further explained by reference to the drawings in which an embodiment of the method of the invention is schematically shown.

Fig. 1 shows in a schematic way a computer network in which a method of the invention is implemented.

Figs. 2 and 3 show flow diagrams of the operation of a

CLAIMS

1. Method for transferring a software module from a sender to a receiver in a computer system or network, wherein the software module comprises at least one object and at least one class, the object being an instance of the class(es), wherein each class or group of classes is provided with a class identifier, wherein both the sender and receiver comprises a database of classes and groups of classes with corresponding class identifiers, wherein the sender transmits the class identifier of a software module to be transferred to the receiver and the receiver checks its database for presence of the received class identifier, wherein the receiver transmits a message "present" or "absent" to the sender and wherein the sender transfers only the object of the software module or both the object and the class or group of classes depending on the presence or absence of the class or group of classes at the receiver.

2. Method according to claim 1, wherein the sender transmits first all objects and the class identifier to the receiver, wherein the sender transmits the class or group of classes to the receiver if a message "absent" is received.

3. Method according to claim 1 or 2, wherein the receiver obtains the software module to be transferred by combining the object received with the class or group of classes retrieved from its database or received, wherein the receiver transmits a message "transfer succeeded" or "transfer not succeeded" depending on whether or not the receiver succeeds in combining the object and class or group of classes.

4. Method according to any one of the preceding claims, wherein the receiver stores each class and group of classes with the corresponding class identifier received in its database for later use.

5. Method according to any one of the preceding claims, wherein the sender provides a class identifier by combining a given name of each class or group of classes of a software module and the result of a cryptographic hash function, wherein said result is obtained by executing a crypto-

graphic hash function on the data file of the class or group of classes.

6. Method according to claim 5, wherein a sender further combines the length of the data file of the class or group of classes with the given name and the result of the hash function to provide the class identifier.

7. Method according to claim 5 or 6, wherein the receiver checks a class or group of classes received from a sender by comparing the result of the hash function of the received class identifier with the result obtained by carrying out the same cryptographic hash function on the data file of the class or group of classes received.

8. Method according to claim 7, wherein the receiver transmits a message "transfer succeeded" or "transfer not succeeded" depending on the comparison of the result of the hash function on the data file received and the result of the hash function of the class identifier.

9. Method according to any one of the preceding claims, wherein senders and receivers are computers in computer network, such as the Internet.

10. Method according to claim 9, wherein the software module is a so-called agent for searching, exchanging and/or providing information on the network.

PATENT COOPERATION TREATY

PCT

INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference	**FOR FURTHER ACTION** see Notification of Transmittal of International Search Report (Form PCT/ISA/220) as well as, where applicable, item 5 below.	
W03473-dV/rp		
International application No.	International filing date *(day/month/year)*	(Earliest) Priority Date *(day/month/year)*
PCT/NL 00/ 00720	06/10/2000	08/10/1999
Applicant		
TRYLLIAN BV		

This International Search Report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This International Search Report consists of a total of 3 sheets.

[X] It is also accompanied by a copy of each prior art document cited in this report.

1. **Basis of the report**

   a. With regard to the **language,** the international search was carried out on the basis of the international application in the language in which it was filed, unless otherwise indicated under this item.

   [ ] the international search was carried out on the basis of a translation of the international application furnished to this Authority (Rule 23.1(b)).

   b. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international search was carried out on the basis of the sequence listing :

   [ ] contained in the international application in written form.

   [ ] filed together with the international application in computer readable form.

   [ ] furnished subsequently to this Authority in written form.

   [ ] furnished subsequently to this Authority in computer readble form.

   [ ] the statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.

   [ ] the statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished

2. [ ] **Certain claims were found unsearchable** (See Box I).

3. [ ] **Unity of invention is lacking** (see Box II).

4. With regard to the **title,**

   [X] the text is approved as submitted by the applicant.

   [ ] the text has been established by this Authority to read as follows:

5. With regard to the **abstract,**

   [X] the text is approved as submitted by the applicant.

   [ ] the text has been established, according to Rule 38.2(b), by this Authority as it appears in Box III. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority.

6. The figure of the **drawings** to be published with the abstract is Figure No. 2

   [ ] as suggested by the applicant.

   [ ] because the applicant failed to suggest a figure.

   [X] because this figure better characterizes the invention.

   [ ] None of the figures.

INTERNATIONAL SEARCH REPORT

International Application No
PCT/NL 00/00720

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 G06F9/46

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 G06F

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)
IBM-TDB, EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	OSHIMA, KARJOTH & ONO: "Aglets Specification 1.1 Draft" INTERNET, 8 September 1998 (1998-09-08), XP002143103 www.trl.ibm.co.jp/aglets/spec11.html	1,4,9,10
Y	page 16, line 31 -page 19, last line	5,7,8
A	---	2,3
Y	EP 0 778 522 A (SUN MICROSYSTEMS INC) 11 June 1997 (1997-06-11) page 5, line 54 -page 6, line 12 --- -/--	5,7,8

[X] Further documents are listed in the continuation of box C.

[X] Patent family members are listed in annex.

° Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
20 December 2000	02/01/2001

Name and mailing address of the ISA	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL – 2280 HV Rijswijk Tel. (+31–70) 340–2040, Tx. 31 651 epo nl, Fax: (+31–70) 340–3016	Bijn, K

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Form PCT/ISA/210 (second sheet) (July 1992)

INTERNATIONAL SEARCH REPORT

International Application No
PCT/NL 00/00720

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication,where appropriate, of the relevant passages	Relevant to claim No.
X	IBM, CRYSTALIZ, GENERAL MAGIC, GMD FOCUS: "Mobile Agent Facility Specification" OMG TC DOCUMENT, 2 June 1997 (1997-06-02), XP002143104 page 12, line 1 -page 13, last line page 40 -page 41, paragraph 3.3.2 ---	1,4,9,10
X	EP 0 841 615 A (INT COMPUTERS LTD) 13 May 1998 (1998-05-13)	1,4
A	column 2, line 39 -column 3, line 56 column 6, line 30 -column 8, line 49 ---	3,5
A	"OBJECT LOCATION ALGORITHM" IBM TECHNICAL DISCLOSURE BULLETIN,US,IBM CORP. NEW YORK, vol. 36, no. 9B, 1 September 1993 (1993-09-01), pages 257-258, XP002045269 ISSN: 0018-8689 the whole document ---	1,5-7
A	US 5 845 077 A (FAWCETT PHILIP E) 1 December 1998 (1998-12-01) column 5, line 48 -column 9, line 8 -----	1

1

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No
PCT/NL 00/00720

Patent document cited in search report		Publication date	Patent family member(s)		Publication date
EP 0778522	A	11-06-1997	US	6067575 A	23-05-2000
			AU	718051 B	06-04-2000
			AU	7402196 A	12-06-1997
			CA	2191522 A	09-06-1997
			CN	1157959 A	27-08-1997
			JP	10069382 A	10-03-1998
EP 0841615	A	13-05-1998	AU	725581 B	12-10-2000
			AU	4436897 A	14-05-1998
			US	5999740 A	07-12-1999
US 5845077	A	01-12-1998	US	6073214 A	06-06-2000

PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference	FOR FURTHER ACTION	See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)
WO 3473-dV/jdh		
International application No.	International filing date *(day/month/year)*	Priority date *(day/month/year)*
PCT/NL00/00720	06/10/2000	08/10/1999
International Patent Classification (IPC) or national classification and IPC G06F9/46		
Applicant TRYLLIAN BV et al.		

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.

2. This REPORT consists of a total of 5 sheets, including this cover sheet.

   ☒ This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

   These annexes consist of a total of 6 sheets.

3. This report contains indications relating to the following items:

   - I ☒ Basis of the report
   - II ☐ Priority
   - III ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
   - IV ☐ Lack of unity of invention
   - V ☒ Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations suporting such statement
   - VI ☐ Certain documents cited
   - VII ☐ Certain defects in the international application
   - VIII ☒ Certain observations on the international application

Date of submission of the demand	Date of completion of this report
04/05/2001	14.11.2001
Name and mailing address of the international preliminary examining authority: European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465	Authorized officer Jaedicke, M Telephone No. +49 89 2399 2357

Form PCT/IPEA/409 (cover sheet) (January 1994)

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No. PCT/NL00/00720

I. Basis of the report

1. With regard to the **elements** of the international application *(Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17))*:
Description, pages:

3-7	as originally filed			
1,2,2a	as received on	25/10/2001	with letter of	24/10/2001

Claims, No.:

1-9	as received on	25/10/2001	with letter of	24/10/2001

Drawings, sheets:

1/3-3/3	as originally filed

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

   These elements were available or furnished to this Authority in the following language: , which is:

   - ☐ the language of a translation furnished for the purposes of the international search (under Rule 23:1(b)).
   - ☐ the language of publication of the international application (under Rule 48.3(b)).
   - ☐ the language of a translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

   - ☐ contained in the international application in written form.
   - ☐ filed together with the international application in computer readable form.
   - ☐ furnished subsequently to this Authority in written form.
   - ☐ furnished subsequently to this Authority in computer readable form.
   - ☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
   - ☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. The amendments have resulted in the cancellation of:

- ☐ the description, pages:
- ☐ the claims, Nos.:
- ☐ the drawings, sheets:

5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)):

   (Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.)

6. Additional observations, if necessary:

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes:	Claims	1-9
	No:	Claims	
Inventive step (IS)	Yes:	Claims	1-9
	No:	Claims	
Industrial applicability (IA)	Yes:	Claims	1-9
	No:	Claims	

2. Citations and explanations
   see separate sheet

VIII. Certain observations on the international application

The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made:
see separate sheet

Re It m V

Reasoned statement under Rule 66.2(a)(ii) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Reference is made to the following documents:

   D1: IBM, CRYSTALIZ, GENERAL MAGIC, GMD FOCUS: 'Mobile Agent Facility Specification' OMG TC DOCUMENT, 2 June 1997 (1997-06-02)

2. The document D1 is regarded as being the closest prior art to the subject-matter of claim 1, when clarified as spcified in section VIII, and discloses all features of the first part of claim 1 (see D1, whole document and in particular pages 10-13 and pages 40-41: please note on page 13, the third bullet "Transfer a list of names of all possible classes with the agent creation or transfer request", lines 1-8). Moreover, D1 discloses in particular that a class name has a name and an octet string that ensures that the class name is unique (see D1, page 40, first paragraph) and suggests code signatures (see D1, page 18, lines 17-19) and discusses on page 16 checks to detect corruptions of transferred data in order to ensure data integrity.
   However, the specific feature that the sender provides the class identifier by combining a given name of each class or group of classes of a software module and the result of a cryptographic hash function, wherein said result is obtained by executing a cryptographic hash function on the data file of the class or group of classes has been neither disclosed nor suggested in D1 nor any other document cited in the International Search Report.
   Hence, the subject-matter of the clarified claim 1 meets the requirements of Article 33 PCT in respect of novelty and inventive step.

3. Dependent claims 2-9 are new and inventive, because this holds for the independent claim to which these claims refer.

4. All claims are industrially applicable.

R It m VIII

Certain observations on the international application

1. Claim 1 is not clear (Article 6 PCT), because the wording of claim 1 is evidently not correct: claim 1 specifies in line 17: "the sender provides each class or group". However, in light of the description and the originally filed claim 5, it is evident that this should read "the sender provides **said class identifier for** each class or group".

WO3473-dV/rp

Method for transferring a software module from a sender to a receiver in a computer system or network

The invention relates to a method for transferring a software module from a sender to a receiver in a computer system or network, wherein the software module comprises at least one object and at least one class, the object being an instance of the class(es), wherein each class or group of classes is provided with a class identifier, wherein both the sender and receiver comprises a database of classes and groups of classes with corresponding class identifier, wherein the sender transmits the class identifier of a software module to be transferred to the receiver and the receiver checks its database for presence of the received class identifier, and wherein the sender transfers only the object of the software module or both the object and class or group of classes depending on the presence or absence of the class or group of classes at the receivermethod for transferring a software module from a sender to a receiver in a computer system or network, wherein the software module comprises at least one object and at least one class, the object being an instance of the class(es).

In object-oriented software technology it is known to build a software module as a combination of so-called objects and classes, wherein the or each object that belongs to a class, is called an instance of the class. The objects generally contain only particular values for the variables specific to a predetermined software module, wherein the variables and methods to be carried out by the software module are defined in the class or classes.

With increasing use of computer systems and networks, such as the Internet, there is an increasing transfer of software modules of the object-oriented type between processes executed within one computer system or between computers of a computer network. This increasing transferring of software modules results in an increase of data traffic within the computer system or computer network.

IBM, CRYSTALITZ, GENERAL MAGIC, GMD FOCUS, 'Mobile Agent Facility Specification', OMG TC Document, 2 June 1997, discloses a common conceptual model for differing mobile agent systems. To implement the transfer of classes, the class must be transferred from the source agent system if it does not exist at the destination agent system. One possible approach is the transfer of a list of the names of all possible classes with the agent creation or transfer request. The destination agent system requests only the classes on that list that it has not cached. The agent is transferred in serialised form, which is able to identify and verify the classes. Agent authenticators are used to provide a secure communications infrastructure. However, an attacker can monitor communications traffic that transports agents and decodes their state data. To counter this attack an agent may demand confidentiality services as a condition for transport. This increases the data traffic within the network.

A first object of the present invention is to provide a method of the above-mentioned type, wherein the data traffic within a computer system or computer network during transferring a software module is reduced.

It is a further object of the invention to provide a method of this type, wherein a software module can be transferred in a secure manner.

According to the invention a method of the above-mentioned type is provided, characterised in that the receiver transmits a message "present" or "absent" to the sender, and the sender provides each class or group of classes by combining a given name of each class or group of classes of a software module and the result of a cryptographic hash function, wherein said result is obtained by executing a cryptographic hash function on the data file of the class or group of classes.

In this manner, a method is obtained, wherein data traffic during transferring software modules is significantly reduced as the classes or groups of classes need not to be transferred in all transfers of software modules, and a secure identifier is obtained, wherein errors due to identical identifiers for different classes or groups of classes are excluded.

AMENDED SHEET

According to a preferred embodiment, the receiver checks a classes or group of classes received from a sender by comparing the result of the hash unction of the received class identifier with the result obtained by carrying out the same cryptographic hash function on the data file of the class or group of classes received.

In this manner security in transferring software modules is guaranteed as receivers will refuse to use classes where the hash function result of the identifier does not match with the hash function result obtained by the receiver from the data file of the class or the group of classes received.

The invention will be further explained by reference to the drawings in which an embodiment of the method of the invention is schematically shown.

Fig. 1 shows in a schematic way a computer network in which a method of the invention is implemented.

Figs. 2 and 3 show flow diagrams of the operation of a

CLAIMS

1. Method for transferring a software module from a sender to a receiver in a computer system or network, wherein the software module comprises at least one object and at least one class, the object being an instance of the class(es), wherein each class or group of classes is provided with a class identifier, wherein both the sender and receiver comprises a database of classes and groups of classes with corresponding class identifier, wherein the sender transmits the class identifier of a software module to be transferred to the receiver and the receiver checks its database for presence of the received class identifier, and wherein the sender transfers only the object of the software module or both the object and class or group of classes depending on the presence or absence of the class or group of classes at the receiver, **characterised in that** the receiver transmits a message "present" or "absent" to the sender, and the sender provides each class or group of classes by combining a given name of each class or group of classes of a software module and the result of a cryptographic hash function, wherein said result is obtained by executing a cryptographic hash function on the data file of the class or group of classes.

2. Method according to claim 1, wherein the sender transmits first all objects and the class identifier to the receiver if a message "absent" is received.

3. Method according to claim 1 or 2, wherein the receiver obtains the software module to be transferred by combining the object received with the class or group of classes retrieved from its database or received, wherein the receiver transmits a message "transfer succeeded" or "transfer not succeeded" depending on whether or not the

receiver succeeds in combining the object and class or group of classes.

4. Method according to any one of the preceding claims, wherein the receiver stores each class and group of classes with the corresponding class identifier received in its database for later use.

graphic hash function on the data file of the class or group of classes.

5~~6~~. Method according to ~~claim 5~~ any one of the preceding claims, wherein a sender further combines the length of the data file of the class or group of classes with the given name and the result of the hash function to provide the class identifier.

6~~7~~. Method according to ~~claim 5 or 6~~ any one of the preceding claims, wherein the receiver checks a class or group of classes received from a sender by comparing the result of the hash function of the received class identifier with the result obtained by carrying out the same cryptographic hash function on the data file of the class or group of classes received.

7~~8~~. Method according to claim 6~~7~~, wherein the receiver transmits a message "transfer succeeded" or "transfer not succeeded" depending on the comparison of the result of the hash function on the data file received and the result of the hash function of the class identifier.

8~~9~~. Method according to any one of the preceding claims, wherein senders and receivers are computers in computer network, such as the Internet.

9~~10~~. Method according to claim 8~~9~~, wherein the software module is a so-called agent for searching, exchanging and/or providing information on the network.

PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference	FOR FURTHER ACTION	See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)
WO 3473-dV/jdh		
International application No.	International filing date *(day/month/year)*	Priority date *(day/month/year)*
PCT/NL00/00720	06/10/2000	08/10/1999
International Patent Classification (IPC) or national classification and IPC G06F9/46		
Applicant TRYLLIAN BV et al.		

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.

2. This REPORT consists of a total of 5 sheets, including this cover sheet.

   ☒ This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

   These annexes consist of a total of 6 sheets.

3. This report contains indications relating to the following items:

   - I ☒ Basis of the report
   - II ☐ Priority
   - III ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
   - IV ☐ Lack of unity of invention
   - V ☒ Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations suporting such statement
   - VI ☐ Certain documents cited
   - VII ☐ Certain defects in the international application
   - VIII ☒ Certain observations on the international application

Date of submission of the demand	Date of completion of this report
04/05/2001	14.11.2001
Name and mailing address of the international preliminary examining authority: European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465	Authorized officer Jaedicke, M Telephone No. +49 89 2399 2357

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No. PCT/NL00/00720

I. Basis of the report

1. With regard to the **elements** of the international application *(Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17))*:
Description, pages:

3-7	as originally filed			
1,2,2a	as received on	25/10/2001	with letter of	24/10/2001

Claims, No.:

1-9	as received on	25/10/2001	with letter of	24/10/2001

Drawings, sheets:

1/3-3/3	as originally filed

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

   These elements were available or furnished to this Authority in the following language: , which is:

   - ☐ the language of a translation furnished for the purposes of the international search (under Rule 23.1(b)).
   - ☐ the language of publication of the international application (under Rule 48.3(b)).
   - ☐ the language of a translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

   - ☐ contained in the international application in written form.
   - ☐ filed together with the international application in computer readable form.
   - ☐ furnished subsequently to this Authority in written form.
   - ☐ furnished subsequently to this Authority in computer readable form.
   - ☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
   - ☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. The amendments have resulted in the cancellation of:

- ☐ the description, pages:
- ☐ the claims, Nos.:
- ☐ the drawings, sheets:

5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)):

   (Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.)

6. Additional observations, if necessary:

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes:	Claims	1-9
	No:	Claims	
Inventive step (IS)	Yes:	Claims	1-9
	No:	Claims	
Industrial applicability (IA)	Yes:	Claims	1-9
	No:	Claims	

2. Citations and explanations
   see separate sheet

VIII. Certain observations on the international application

The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made:
see separate sheet

Re Item V

Reasoned statement under Rule 66.2(a)(ii) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Reference is made to the following documents:

   D1: IBM, CRYSTALIZ, GENERAL MAGIC, GMD FOCUS: 'Mobile Agent Facility Specification' OMG TC DOCUMENT, 2 June 1997 (1997-06-02)

2. The document D1 is regarded as being the closest prior art to the subject-matter of claim 1, when clarified as spcified in section VIII, and discloses all features of the first part of claim 1 (see D1, whole document and in particular pages 10-13 and pages 40-41: please note on page 13, the third bullet "Transfer a list of names of all possible classes with the agent creation or transfer request", lines 1-8). Moreover, D1 discloses in particular that a class name has a name and an octet string that ensures that the class name is unique (see D1, page 40, first paragraph) and suggests code signatures (see D1, page 18, lines 17-19) and discusses on page 16 checks to detect corruptions of transferred data in order to ensure data integrity.
   However, the specific feature that the sender provides the class identifier by combining a given name of each class or group of classes of a software module and the result of a cryptographic hash function, wherein said result is obtained by executing a cryptographic hash function on the data file of the class or group of classes has been neither disclosed nor suggested in D1 nor any other document cited in the International Search Report.
   Hence, the subject-matter of the clarified claim 1 meets the requirements of Article 33 PCT in respect of novelty and inventive step.

3. Dependent claims 2-9 are new and inventive, because this holds for the independent claim to which these claims refer.

4. All claims are industrially applicable.

Re Item VIII

Certain observations on the international application

1. Claim 1 is not clear (Article 6 PCT), because the wording of claim 1 is evidently not correct: claim 1 specifies in line 17: "the sender provides each class or group". However, in light of the description and the originally filed claim 5, it is evident that this should read "the sender provides **said class identifier for** each class or group".